East African Medical Journal Vol. 98 No. 8 August 2021
MATERNAL AND NEONATAL CHARACTERISTICS AFFECTING IMMEDIATE OUTCOMES OF EXTREMELY LOW BIRTH WEIGHT INFANTS AT IDO-EKITI, NIGERIA
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MATERNAL AND NEONATAL CHARACTERISTICS AFFECTING IMMEDIATE OUTCOMES OF EXTREMELY LOW BIRTH WEIGHT INFANTS AT IDO-EKITI, NIGERIA

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ABSTRACT

***Objective*: This study aimed to evaluate the maternal and neonatal characteristics affecting the survival of Extremely Low Birth Weight (ELBW) infants at Federal Teaching Hospital, Ido-Ekiti (FETHI).**

***Study design:* A retrospective study in which the clinical records of ELBW infants admitted between January 2013 and December 2017 were reviewed. The main outcome was survival of the participants. The maternal and neonatal variables of discharged babies were compared with those that died using with Chi square analysis and Student's t-tests. p-value was set at 0.05.**

***Study Participants:* All ELBW infants managed in FETHI during the study period.**

***Results:* 1236 babies were admitted into the neonatal unit during the study period out of which 33 (2.7%) were ELBW babies. The mean gestational age (GA) and mean birthweight (BW) of the ELBW babies were 27.2 ± 2.7 weeks and 780 ± 130g respectively. The overall survival rate was 30.3%. The mean GA of survivors versus non-survivors was 28.1 ± 1.7 weeks versus 26.8 ± 2.9 weeks (p = 0.210). The mean BW of the survivors was 870 ± 50g versus 740 ± 130g (p = 0.005) for the non-survivors. Significantly associated with survival were maternal age above 20 years (p < 0.026), neonatal age at presentation less than 24 hours (p <0.005) and BW ≥ 800g (p <0.005).**

***Conclusion:* Though the survival of ELBW infants in this study is still low (30.3%); birthweight ≥ 800g, early hospital presentation and a maternal age greater than 20 years old greatly improve the chances of survival.**

INTRODUCTION

The outcomes of Extremely Low Birth Weight (ELBW) babies, that is, babies born with a birthweight less than 1000g, has garnered a great deal of interest globally in recent times owing largely to the advances in obstetric and neonatal care. Such advances include assisted reproductive techniques, availability of antenatal steroids, administration of surfactant and establishment of well-equipped neonatal intensive care units.[1-3]

However, all the elements of the advances in obstetric and neonatal care cannot be said to be uniformly available in resource-poor settings. Despite this deficit in care, more than 60% of global preterm births occur in lower-income countries; with Nigeria having the highest number of preterm births in Sub-Saharan Africa.[4] The World Health Organization reports that prematurity contributes between 28 - 40% of early neonatal deaths.[3] In Nigeria, ELBW infants are reported to constitute between 1 – 6% of hospital admissions,[5-7] however there is still a relative dearth of studies on the outcomes of ELBW infants in Nigeria when compared to the developed countries probably because of the challenges associated with their care and in many instances, the poor outcomes recorded. The aim of this study, therefore, was to review the survival of these infants in our neonatal unit and evaluate factors determining their survival. This may ultimately help to improve the outcomes in these population of patients.

MATERIALS AND METHODS

Study area and setting: The Federal Teaching Hospital, Ido-Ekiti (FETHI), Ekiti State, is a tertiary health facility that serves the health needs of the communities in Ekiti, Ondo, Osun and Kwara States in the South-West zone of Nigeria. The hospital provides specialist care in specialized areas of Medicine, Surgery, Obstetric and Paediatric care. The neonatal ward has a capacity for 36 admissions and receives babies delivered in the labour ward of the hospital (Inborns) as well as sick babies referred from outside the hospital (Outborns). The neonatal ward generally provides Level II and the equipment available include incubators, LED phototherapy units, resuscitaires, Oxygen driven Bubble CPAP, syringe pumps, infusion pumps, pulse oximeters, glucometers as well as facilities for KMC. Oxygen is delivered by a piped system.

The ward is taken care of by 2 Paediatricians, 1 Senior Registrar, 2 Junior Registrars and 2 interns and 23 nurses. As at the time of this study there were no facility for mechanical ventilation, exogenous surfactant administration and total parenteral nutrition.

Study Design and Subjects: This was a retrospective study. Approval for the study was obtained from the Ethics and Research Committee of the hospital. The admissions record in the neonatal ward register for the period January 2013 to December 2017 was reviewed. The babies whose birth weights were less than 1,000 grams irrespective of their GA had their admission/hospital case notes retrieved from the Health Information Department of the hospital and these formed the study participants.

METHODS

The information required was entered into a proforma pre-designed for the study. The following relevant data were extracted: maternal characteristics such as age, level of education, occupation, obstetric data including the parity, ANC attendance, antenatal steroids and mode of delivery. Neonatal data such as postnatal age on admission, sex, BW, GA, place of birth, other co-morbidity at admission and while on admission, treatment received

including respiratory support CPAP, phototherapy, exchange blood transfusion, the postnatal age and post-conceptional age at demise or discharge were recorded. Gestational age was determined by information obtained from the last menstrual period, antenatal ultrasonography and postnatal gestational assessment using the New Ballard Score.[8] The study participants did not have surfactant administration, nor did they have mechanical ventilation.

Data analysis and management: Data were entered into an MS-Excel spreadsheet and then imported to the statistical package SPSS version 23 for analysis. Descriptive statistics included mean, standard deviation, and associated percentages where appropriate. The Chi square test was used for testing the significance of associations between categorical variables. The level of statistical significance was set at $p < 0.05$. The discharged babies and those that died were compared using maternal and neonatal variables with Chi square analysis and Student's t-tests.

RESULTS

General characteristics of the babies: A total of 1236 babies were admitted into the neonatal unit over the period; 33 of these were ELBW babies which accounted for 2.7% of the total admissions. Eighteen (54.5%) of the 33 neonates were male, while 15 (45.5%) were females. The male: female ratio was 1.2:1. The GA of the participants ranged from 23 to 34 weeks with the mean being 27.2 ± 2.7 weeks. The BW ranged from 500g to 950g, and the mean was 780 ± 130g. Nineteen (57.5%) of the babies were Inborn while 14 (42.5%) were delivered outside the hospital (comprehensive health centres, private hospitals, and en-route to the hospital). Fifteen (45.5%) babies presented within the first 24 hours of life while the remaining 18 (54.6%) presented after 24 hours of life.

Ten of 33 babies survived giving a survival rate of 30.3%. There was no significant difference between the mean GA of babies who survived and those who died whereas the babies who survived were significantly heavier at birth. The mean GA of the babies who survived was 28.1 ± 1.7 weeks while 26.8 ±2.0 weeks was the mean GA for the non-survivors ($t = 1.3$, $p = 0.20$). The mean BW of the survivors was 870 ± 50g while it was 740 ± 130g for the non-survivors ($t = 3.04$, $p = 0.005$). None of the babies delivered at less than GA 26 weeks or weighing less than 800g survived. Table 1 shows the comparison of neonatal characteristics between the babies that survived and the non- survivors.

Table 1

Comparison of neonatal characteristics between babies that survived and those that died

Variable	Frequency N = 33	Percentage (%)	Survived	Dead	P value
Age at presentation (in days)					
Less than 1	15	45.5	8	7	
1 – 5	14	42.4	0	14	
More than 5	4	12.1	2	2	
Range	*0 - 13*				
Gender					
Male	18	54.5	4	14	
Female	15	45.5	6	9	
Estimated Gestational Age (weeks)					
23 - <26	10	30.3	0	10	
26 - <28	10	30.3	4	6	
28 - <32	10	30.3	6	4	
32 – 34	3	9.1	0	3	
Mean EGA ± SD	*27.2 ± 2.7*		28.1 ± 1.7	26.8 ± 2.0	0.20
Birth Weight (Kg)					
0.500 – 0.599	3	9.1	0	3	
0.600 – 0.699	4	12.1	0	4	
0.700 – 0.799	5	15.2	0	5	
0.800 – 0.899	10	30.3	4	6	
0.900 – 0.999	11	33.3	6	5	
Mean Birth Weight ± SD	*0.78 ± 0.13*		0.870 ± .50	0.740 ± 0.13	0.005
Place of Delivery					
En route to the hospital	2	6.1	0	2	
FETHI	19	57.5	6	13	
CHC	6	18.2	3	3	
Private	6	18.2	1	5	

FETHI: Federal Teaching Hospital, Ido-Ekiti. CHC: Comprehensive Health Centre

Duration of admission and time of death: The duration of admission for the discharged neonates ranged from 28 days to 70 days with a mean of 49.6 days while the weights at discharge ranged from 1300g to1450g with a mean of 1380±40g.

Out of the 23 neonates that died, 13 (56.5%) died within the first 72 hours of life, and a total of 17 (73.9%) had died by the end of the first week. The mean age at death was 4.65 days.

Maternal characteristics of the babies: Of the 33 subjects, 54.5% of the mothers were between ages 20 to 29 while there were 2 (6.6%) teenage mothers and 13 (39.4%) were above 30 years. Majority (75.8%) of the mothers had at least secondary school education and only 1(3.0%) mother with no formal education. Table 2 shows the comparison of maternal characteristics between the babies that survived and those that died. There were no survivors among the infants of the teenage mothers.

Table 2

Relationships between maternal characteristics and ELBW infant mortality

Variable	Mortality			
	Dead n (%)	Alive n (%)	Chi square	p-value
Maternal Age				
< 20	2 (100.0)	0 (0.0)	7.323	0.026
20 – 29	9 (50.0)	9 (50.0)		
≥ 30	12 (92.1)	1 (7.7)		
Maternal Education				
None	0 (0.0)	1 (100.0)	4.414	0.220
Primary	5 (71.4)	2 (28.6)		
Secondary	7 (58.3)	5 (41.7)		
Tertiary	11 (84.6)	2 (15.4)		
Maternal Occupation				
Artisan	4 (50.0)	4 (50.0)	6.313	0.177
Civil Servant	9 (81.8)	2 (18.2)		
Farmer	0 (0.0)	1 (100.0)		
Trader	4 (100.0)	0 (0.0)		
Unemployed	6 (66.7)	3 (33.3)		
Maternal Marital Status				
Married	14 (66.7)	7 (33.3)	0.251	0.616
Not married	9 (75.0)	3 (25.0)		
ANC attendance				
Yes	14 (66.7)	7 (33.3)	0.251	0.616
No	9 (75.0)	3 (25.0)		
Steroids				
Yes	2 (66.7)	1 (33.3)	0.014	0.905
No	21 (70.0)	9 (30.0)		
Place of Delivery				
En route hospital	2 (100.0)	0 (0.0)	2.515	0.473
FETHI	13 (68.4)	6 (31.6)		
CHC	3 (50.0)	3 (50.0)		
Private	5 (83.3)	1 (16.7)		

FETHI: Federal Teaching Hospital, Ido-Ekiti. CHC: Comprehensive Health Centre

DISCUSSION

In the present study and in our unit, the contribution of ELBW to neonatal admissions over the study period was 2.7%. This is similar to the recent finding of Kayode-Adedeji et al[9] who reported a 3% contribution of ELBW to neonatal admissions in their study. It is, however, higher than the figure of 1.9% reported by Okoji and Oruamabo[5]more than 25 years ago. This increment over the study of Okoji and Oruamabo[5] may be explained by the overall global and national advancement in perinatal and neonatal care. Though, the contribution of ELBW to neonatal admissions is still apparently low from this study, low rates of admission have also been recorded in some reviews from sub-Saharan Africa ranging from 5% to 15%.[10,11,12] The low admission rates may be related to the

presumption that many of such babies are considered as non-viable and never brought to the hospital.[12] Furthermore, In sub-Saharan Africa, Nigeria inclusive the fact that up to 65% of births occur outside hospitals and are supervised predominantly delivered by traditional birth attendants (TBAs)[5] may contribute to the non-presentation of ELBW infants to the hospitals.[13]

The survival rate of 30.3% in the present study is comparable with the survival rate of 33% reported by Kayode et al[9] in Irrua, Edo State which also provides level II neonatal care. It is also similar to the survival rates of 32 -35%[14,15] reported in centres in South Africa where nasal CPAP and surfactant administration were not administered comparable to the situation in our facility as at the time of this study. Our survival rate is higher than that reported by Abdulkadri et al in the north-central part of the country.[12] However, the survival rate recorded in our study is far lower than the 75% survival rate reported from another hospital in South Africa where infants weighing 500 – 1000g received respiratory support as nCPAP after administration of surfactant as standard care when indicated.[16] Mainland China also reported a survival rate of 50%,[17] but in that study, the standard of care involves surfactant and mechanical ventilation. It can be surmised from these reports that the survival of ELBW is related to the level of care available for their care, particularly: surfactant administration, appropriate respiratory support, and antenatal steroids for the mother.

Administration of antenatal steroids has been shown to improve survival in preterm babies due to the reduction in the severity of RDS,[18,19] unfortunately, only 3 (9.1%) of the mothers in this study had antenatal steroids. This is because the hospital being a referral centre receives most women as emergency obstetric cases for whom the luxury of time was not available to give antenatal steroids before delivery. The role of antenatal steroid in preterm survival could therefore not be assessed. Survival of some of the babies without surfactant administration and maternal antenatal steroids may not be unconnected with chronic hypoxia many of the babies may have had.

In the present study, none of the babies below 26 weeks GA survived. These findings are consistent with previous reports from other investigators[3,6,14,15] and it may not be surprising because the alveolar phase of lung development commences at 26 weeks gestation.[18] The use of Bubble CPAP alone for respiratory support in the absence of good lung maturity may not be directly compatible with life.[18,20] Our study showed 100% mortality for babies less than 26 weeks gestation.

Guidelines vary in different parts of the world on the thresholds of GA and BW of infants deemed eligible for resuscitation.[21-23] In the present study, BW of 800g or more was associated with higher survival rates which was comparable with the results of other studies conducted in resource-poor settings.[3,6,24] Our study has affirmed that the relationship between outcome and the birthweight is directly proportional as survival improved geometrically when the subgroup 800 – 899g was compared to the subgroup 900 – 999g. A large multicenter study in China has suggested that BW <750g and GA < 28 weeks were the main predictors of mortality in ELBW infants.[17] The mean BW of surviving infants was approximately 130g greater than those who died. However, due to the small numbers in this current study and unpredictable presence and severity of co-morbidities, no cut-off weight could be used as a predictor for survival. As regards observed neonatal characteristics associated with outcome in the present study, early presentation at a tertiary centre, higher birthweight and gestational ages

proved to be factors influencing the survival of babies although the small numbers prevented a definitive inference from the results. The observation however is consistent with other reports of the factors influencing outcome.[3,6,9,16] Even though babies died at all the classified gestational ages and weights, this may be attributed to degree of lung maturity and varying ability to cope with extrauterine environment with significant respiratory support, infections, and presence of other co-morbidities in ELBW babies which may also vary in severity.

Also, unavailability of other logistics like easy transportation of babies from places of delivery to the study location could also have caused late presentation for some of the babies. The prolonged duration of admission of ELBW neonates constitutes an enormous financial challenge for the parents and caregivers as health care funding in our setting is largely out-of-pocket. The average duration of admission was 49 days. The cause of prolonged duration of admission is multi-factorial which includes feeding intolerance, late/poor weight gain, late-onset sepsis, and caregiver burnout with reducing lactation which are not unusual with care of ELBW babies.[25] It is therefore, imperative to emphasize the need to strengthen and expand health insurance schemes in developing countries so that the financial burden on parents to take care of these infants is reduced to the barest minimum.

Limitations of the Study: This was a retrospective hospital-based study which may not completely reflect the overall mortality rates of ELBW infants in the community. The total number of subjects was relatively small such that studies with larger sample size may be required to definitively affect decision and policies.

CONCLUSION

This study shows a survival rate (30%) in ELBW infants; though it is still less than optimal, it is nonetheless encouraging considering the low income setting of the study especially when compared to data from other centres in the developed world. A BW of ≥ 800g, early hospital presentation and a maternal age greater than 20 years old have been found to be significantly associated with survival of these population of patients.

Low levels of antenatal care and administration of maternal antenatal steroid, non-availability of surfactant and inadequate respiratory support may be implicated in the low survival rates of ELBW infants in this environment. Therefore, there is a need to ensure free, available, and accessible antenatal care for pregnant mothers at early gestational ages, administration of antenatal steroids when the continuation of the pregnancy is threatened, subsidized surfactant costs, and improved facilities for respiratory support could greatly improve the chances of survival of ELBW infants in low-resource settings.

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